

Notice of Allowability

Application No.

10/626,098

Examiner

Henry S. Hu

Applicant(s)

GASH ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Pre-Amendment of 5-4-2004.
2. ☒ The allowed claim(s) is/are 1-16.
3. ☒ The drawings filed on 23 July 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in two telephone interviews with **Ann M. Lee (tel. 925 422-6458) on July 16 and 19, 2004** to amend both claims and specification:

Claim

Claim 1 at line 10 replace the phrase of "polymer-containing" with "epoxide-containing"

Claim 3 at line 2 replace the word of "oxide" with "ion salt"

Claim 5 at line 2 replace the phrase of "Viton^R A, A-100 " with
"vinylidene fluoride-hexafluoropropylene copolymer"

Claim 6 at line 2 replace the word of "Claim 1" with "Claim 4"

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Claim 6 at line 2 replace the phrase of “Viton^R A, A-100 ” with
“said fluoroelastomer”

Claim 14 at line 2 replace the phrase of “Viton^R A, A-100 ” with
“vinylidene fluoride-hexafluoropropylene copolymer”

Specification

Page 1, Paragraph 0002 at line 2 insert the phrase of “now US Patent No. 6,712,917”
between “2002” and “entitled”

Page 5, Paragraph 00010 at line 3 replace the word of “*insitu*” with “*in situ*”

Page 5, Paragraph 00010 at line 9 replace the word of “09/581,234” with “09/587,234”

Page 5, paragraph 00010 at line 10 add the phrase of “and now abandoned” after the
word of “assignee”

Page 7, Paragraph 00015 at line 3 replace the word of “oxophillic” with “oxophilic”

Page 7, Paragraph 00015 at line 4 replace the word of “oxophillic” with “oxophilic”

Abstract, Page 22 at line 5 replace the word of “oxophillic” with “oxophilic”

DETAILED ACTION

2. Applicants' pre-amendment filed on May 4, 2004 was received.

Claims 1-16 were amended to correct both the wording on claim number and its claim dependency. This application 10/626,098 is a **DIV** of application 10/186,468 filed June 28, 2002, now issued as US Patent No. 6,712,917. Applicants' **Pre-Amendment** filed as this application on July 23, 2003 is acknowledged. The priority information on page 1 at paragraph #0002 has been thereby updated. Eight figures (figs. 1, 2, 3a, 3b, 3c, 4, 5 and 6) in the three drawing sheets filed with this DIV application have been accepted by the examiner. **Claims 1-16 are pending now.**

Allowable Subject Matter

3. Claims 1-16 are allowed.
4. The following is an examiner's statement of reasons for allowance: The above claims 1-16 are allowed over the closest references:
5. The limitation of amended parent **Claim 1** of present invention relates to **a nanocomposite produced by the process comprising: (a) dissolving a metal ion salt, (b) adding an epoxide to solution from (a), (c) dissolving a polymer in the same solvent used in (a), (d)**

Adding the polymer solution from (c) into solution from (b), and (e) Stirring solution from (d) until it gels. Other Parent Claim 10 relates to a nanocomposite from Claim 1 with epoxide-metal oxide-containing inorganic sol-gel phase interpenetrated by organic polymer. See other limitations of Claims 2-9 and 11-16.

6. In view of both pre-amendment and the examiner's amendment, the amended parent **Claim 1** of present invention relates to a nanocomposite can be prepared by a gel preparation process, particularly with step (d) by adding the pre-formed polymer solution prepared on step (c) into a solution prepared on step (b) containing both an epoxide compound and an metal ion salt, followed by stirring until the gel formed as step (e). Other parent claim 5 relates to a nanocomposite having the same components used by Claim 1 and with epoxide-metal oxide-containing inorganic sol-gel phase interpenetrated by organic polymer.

USPG-PUB 2002/0104599 A1 to Tillotson et al. only discloses that a method for producing nano-structured metal-oxides involves the dissolution of the metal salt in a solvent followed by the addition of a proton scavenger (e.g., epoxides such as propylene oxide). The sol-gel process may allow for the addition of metals or polymers to the viscous sol, just before gelation, to produce a **uniform distributed nanocomposites** upon gelation.

Although Tillotson further discloses by using acetone and ethanol as solvent, the gel time can be controlled by using different epoxides in Table 4, for some examples gel time is 320

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minutes when trimethylene oxide is used. However, Tillotson is silent specifically about a pre-formed polymer solution was used.

7. It is noted that using the addition of a polymer solution as disclosed in current invention is quite different from adding “insoluble material such as metals or polymers to the viscous gel” by Tillotson, since **the gel obtained by Tillotson may be a heterogeneous composition, while the gel by current invention will be clearly a molecularly homogeneous composition.** It is also noted that the dissolution of polymer into a solution takes much more time than dissolving a small molecule, sometimes several days is required.

US Patent No. 5,698,483 to Ong et al. only discloses that a process for producing nano-size powders comprises the steps of mixing an aqueous continuous phase comprising at least one metal cation salt with a hydrophilic organic polymeric disperse phase, and the formation of gel can be obtained by stirring the polymer/salt solution with a spatula in examples I- VI. However, Ong is silent about (A) adding epoxide to metal ion salt solution as well as (B) preparing a polymer solution before the mixing.

Although US Patent No. 5,962,608 to Ryang et al. has disclosed that epoxy compounds can be added with the metal oxide precursor to condense with the hydroxyl groups of metal oxide to form a polymeric molecule. Ryang did not teach the addition of a polymer solution as well as using a common solvent. In contrary to become a polymer solution, the polymer added

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by Ryang is not dissolved in the solvent, but rather absorbs the metal salt solution into its structure.

8. **US Patent No. 5,629,380 to Baldwin et al.** only disclose a curable, structural epoxy adhesive composition comprising an amine coupling agent, an epoxy resin, and a calcium metal salt (column 3, line 24-43). The reaction between metal ion and epoxide has been disclosed (column 3, line 44 –column 4, line 62).

US Patent No. 5,788,950 to Imamura et al. only disclose a method for the synthesis of mixed metal oxide powders, which is useful in coprecipitation and sol-gel routes (title; abstract, line 1-20). Acetone or ethanol is used as a solvent (column 7, line 8-12). However, **no epoxide or polymer is included in the composition.**

With respect to **US Patent No. 5,726,247 to Michalczyk et al.**, which is cited in a PCT International Search Report dated 12-16-2003, it discloses a fluoropolymer nanocomposite comprising a **fluoropolymer phase and an inorganic oxide phase** dispersed throughout and having particles less than 75 nm (abstract, line 1-3; column 2, line 23-34). However, **no epoxide is included with metal oxide in the inorganic phase.**

9. With respect to **Claims 2, 8-9, 11 and 15-16 using a fuel metal powder**, **US Patent No. 6,183,852 to Rorabaugh et al.** only discloses in example 5 that aluminum powder with 325 WSI

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mesh size can be added to sol-gel process, the advantage is including metal particles that corrode *in situ* to binder may help to achieve both the desired strength and density.

With respect to **Claims 4-6 and 13 using a fluoroelastomer**, **US Patent No. 5,840,796 to Badesha et al.** only discloses that Viton A fluoropolymer can be included in making polymer nanocomposites to improve its thermal stability, while **US Patent No. 6,331,509 to Heimann et al.** only discloses that Viton-A-100 is used for the preparation of gel or grease composition to improve corrosion resistance.

10. With respect to other **parent Claim 10**, it relates to a nanocomposite from Claim 1 with epoxide-metal oxide-containing inorganic sol-gel phase interpenetrated by organic polymer. It is noted by the examiner that a pre-prepared true solution of polymer is necessary, especially when gel time is short, **in the process in order to be interpenetrated with inorganic sol gel phase and then to obtain such a homogeneous nanocomposite**.

In summary, all of the above-mentioned nine references fail to teach or fairly suggest using a pre-prepared polymer solution. Additionally, they fail to teach the advantage by making a molecularly homogeneous gel composition as mentioned in the present application in pages 14-17. Therefore, the above-mentioned references, in combination or alone, fails to teach or fairly suggest the limitation of present invention.

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11. The key issue regarding a gel preparation process, by adding the pre-formed polymer solution from step (c) into solution from step (b) containing an **epoxide compound and an metal ion salt**, followed by stirring until the gel formed, cannot be overcome by any or the combination of the above references, therefore, the present invention is novel.

12. As of the date of this office action, the examiner has not located or identified any reference that can be used singularly or in combination with another reference including the above references to render the present invention anticipated or obvious to one of the ordinary skill in the art. Therefore, the two independent and parent **Claims 1 and 10** are allowed for the reason listed above. Since the prior art of record fails to teach the present invention, the remaining pending **Claims 2-9 and 11-16** are passed to issue.

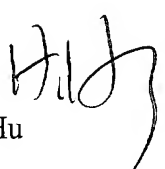
13. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

14. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Henry S. Hu whose telephone number is (571) 272-1103. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached


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on (571) 272-1114. The fax number for the organization where this application or proceeding is assigned is (703) 872-9306 for regular communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Henry S. Hu

June 19, 2004


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